US Army Corps
of Engineers
North Central Division

Great Lakes Update

No. 104 March 2, 1994

Great Lakes Storm Damage Reporting System

The Great Lakes Storm Damage Reporting System (GLSDRS) has completed its first six months of field testing. The Chicago District's Economic Analysis Branch, on assignment from the North Central Division, established the GLSDRS. The System monitors meteorological data (water levels, wave heights, wind speed, and wind direction) to identify storm activity on the Great Lakes, and then conducts a telephone survey to gather damage information from the affected area. Damages are reported by residential riparian homeowners, and consist of both monetary damages to property and land lost to erosion. During 1993, the GLSDRS produced reports on twenty-two storm events and their associated damages.

The GLSDRS uses the Marine Observation Network of NOAA's CoastWatch program to gather the meteorological data that serve as indicators of a storm. The Network consists of Coast Guard stations, CMAN (Coastal Marine Automated Network) stations, buoys, Surface Airways stations, and Coastal stations recording weather measurements as often as every

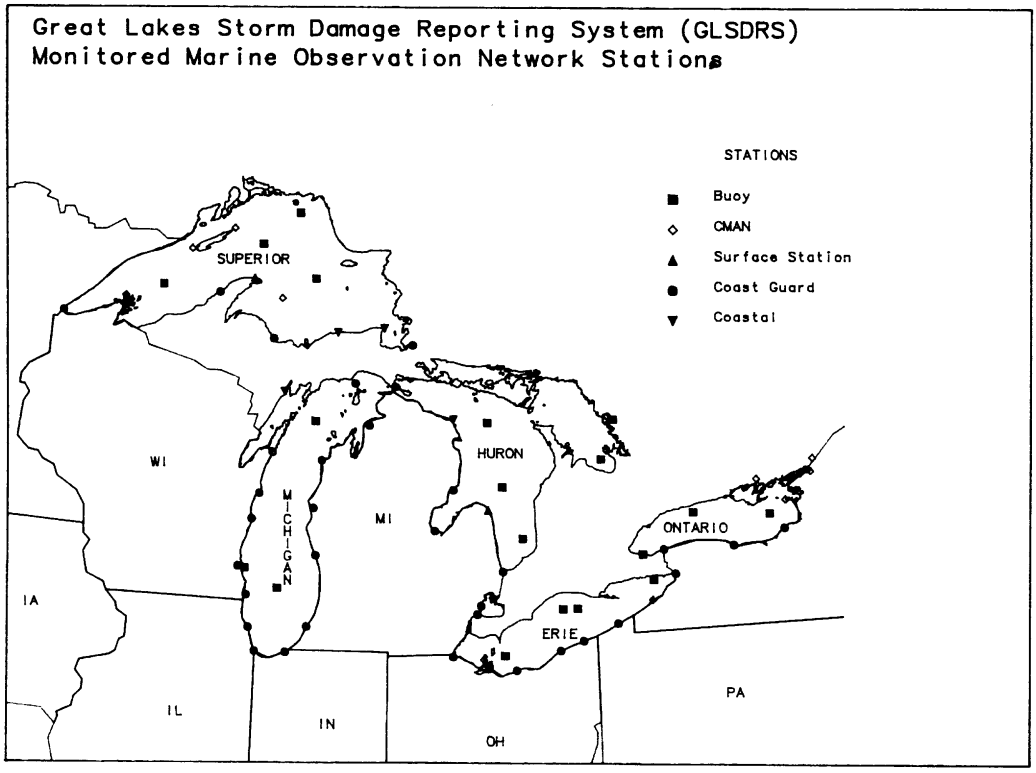

Figure 1

hour (see figure 1). Through CoastWatch, this information is downloaded daily and compared to storm criteria developed by the Chicago District's Coastal Engineering Branch. The criteria used to initiate almost all the surveys completed are: minimum wave heights of three feet; wind speeds on Lakes Superior, Michigan, and Huron of seventeen knots; wind speeds on Lakes Erie and Ontario of thirteen knots; and a storm duration of ten hours. In addition, changes in water level data (from NOS water gages) are used to determine the possible severity of a storm (see figure 2). Some field tests, however, show limited damages from storms meeting the minimum criteria. Thus, for future storms the wind speed threshold values have been raised by three knots for all lakes, and the storm duration requirement increased by two hours.

When actual measurements meet or exceed the storm criteria, a telephone sampling of riparian owners is conducted for the counties in the storm area. The sample size is approximately ten percent of the total riparian population in the county. Following receipt of the survey data, a report is compiled detailing the water level, wind direction, wind speed, and duration of each storm event, and the associated damages. Computerized monitoring telephone surveying, and in house processing enable the GLSDRS to report near real-time information, and to cover the entire U.S. shoreline of the Great Lakes Basin.

Occasionally, the Chicago District receives phone calls from a few of the people being surveyed. The project's newness means that most people are unfamiliar with the study. To ease any concerns, the telephone interviewers are trained to explain the project's purpose. At

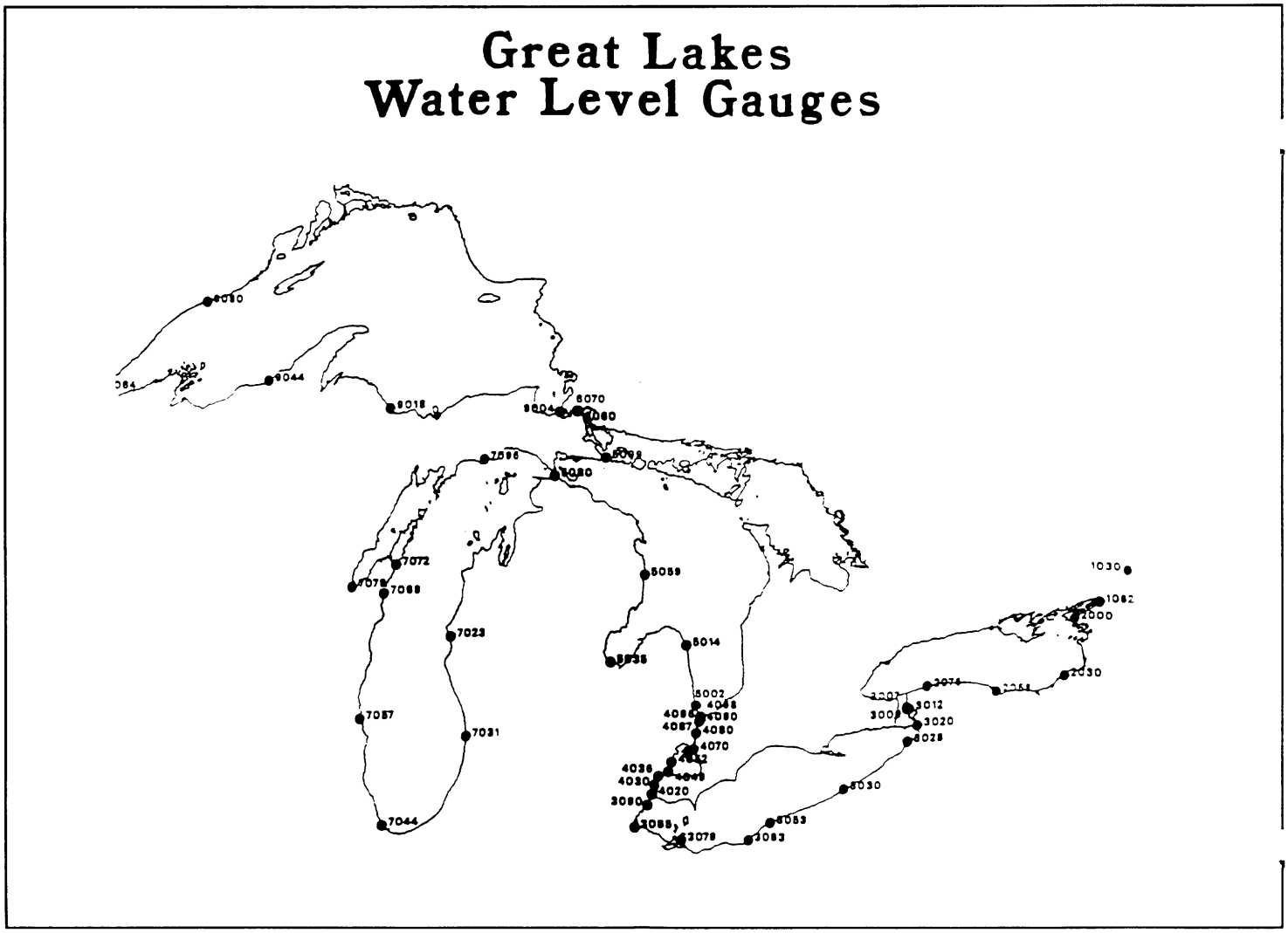

Figure 2

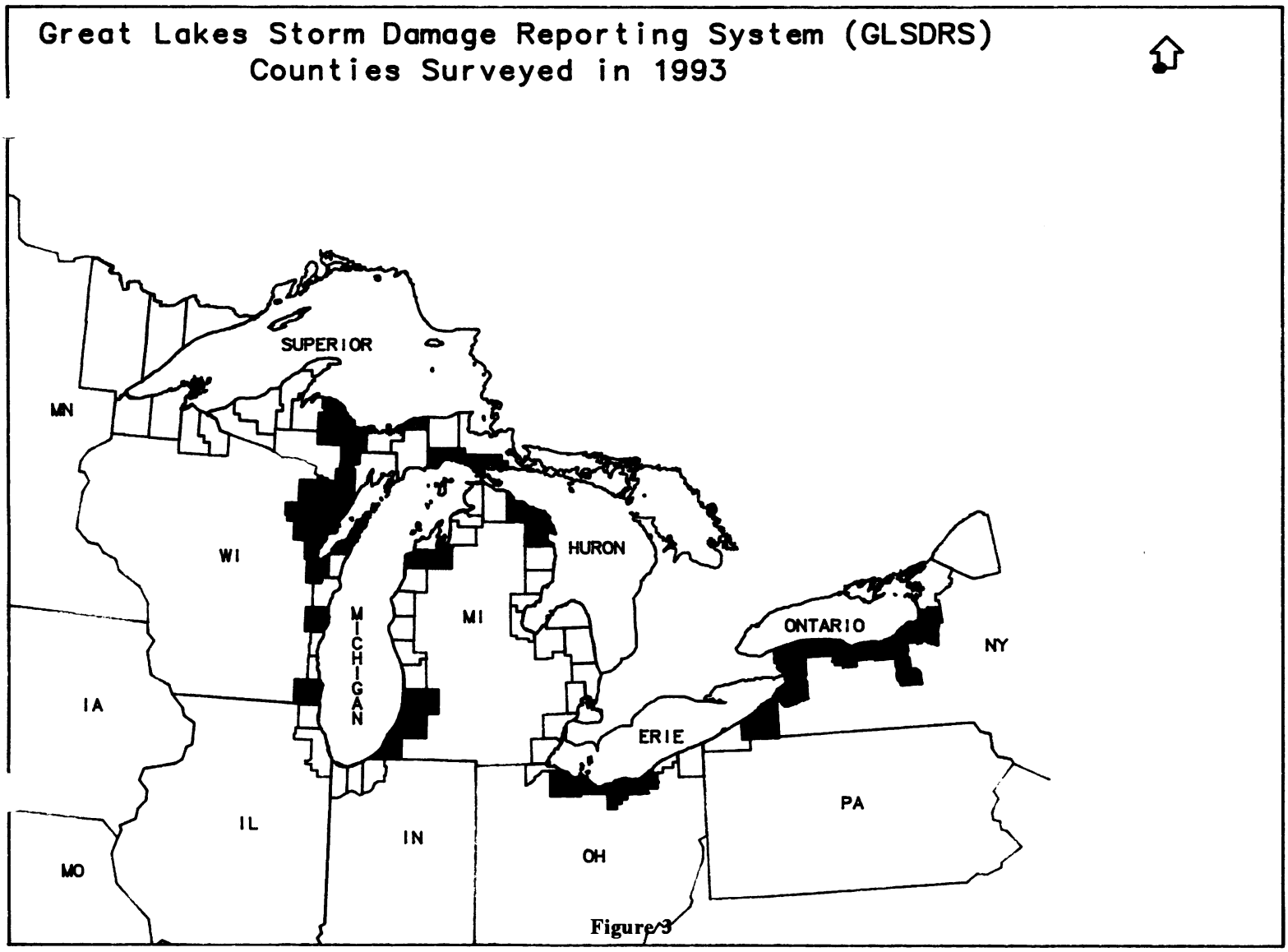

Figure 3

the end of the telephone interview, a point of contact at the Chicago District's Economic Analysis Branch and a tollfree number are provided to homeowners. Usually, an explanation of the project answers any questions.

The twenty-two surveys conducted to date cover 32 counties on all five of the Great Lakes (see figure 3). The more than two thousand riparian property owners surveyed in those counties reported about one million dollars in damages (not including land lost to erosion). Projecting beyond the sample surveyed to all riparians in the counties studied yields $9,572,822 in damages (see Table 1). Table 2 shows a breakdown of the total reported property damages.

The Structure and Content category includes physical damages to houses and garages, and to their contents such as furnishings and appliances. Landscaping consists mainly of reported damages to yard plantings. Shore Protection Structures comprise breakwall, seawall, or retaining wall damages. The damage category labelled "Other" covers harm to vehicles, boats, docks, and miscellaneous items. For all shoreline counties surveyed, Shore Protection Structures represent the greatest part of all damages, followed by Structure and Content, and Landscaping damage. Generally, more people reported Landscaping damage than Structure and Content or Shore Protection Structure damage, but the amount of each respondent's damages in these two categories was larger than the reported Landscaping damages.

The GLSDRS also tracks the incidence of flooding and

Table 1
Number of Riparian Homeowners and Property Damages

Lake	Number of Surveys	Number of Owners Surveyed	Total Reported Damages	Projected Damages for all Riparians
Superior	3	151	$1,515	$14,434
Michigan	6	805	$375,816	$3,740,801
Huron	2	198	$2,880	$29,192
Erie	6	574	$407,713	$3,560,625
Ontario	5	379	$230,511	$2,227,770
Total	22	2107	$1,018,435	$9,572,822

Source: U.S. Army Corps of Engineers, Chicago District

Table 2
Types of Reported Property Damage for Surveyed Riparians

Lake	Structure and Contents	Landscaping	Shore Protection Structures	Other	Total Property Damages
Superior	$75	$300	$0	$1,140	$1,515
Michigan	$8,221	$157,060	$191,780	$18,755	$375,816
Huron	$0	$2,580	$0	$300	$2,880
Erie	$248,027	$35,971	$31,425	$92,290	$407,713
Ontario	$24,137	$42,829	$132,100	$31,445	$230,511
Total	$280,460	$238,740	$355,305	$143,930	$1,018,435
Percent of Total Damages	27.6%	23.4%	34.9%	14.1%	100.0%

Source: U.S. Army Corps of Engineers, Chicago District

erosion. Reported flooding experience is low, ranging from none to 13.2% of respondents. The percent of riparian owners suffering erosion is greater and more diverse, ranging from a low of 9.6% to 56.0%. More field testing of the system should provide a clearer picture of both flooding and erosion and their relationship to storm criteria.

More surveys should also yield information on the severity of storms and the kind of damages they can cause. With an understanding of the interrelationships between storm criteria, and the dynamics of storm events, GLSDRS may provide insight into reducing future damages, and provide some guidance for future shoreline projects.

Possible Storm Induced Rises

Table 3 in this *Update* is for the month of March 1994. Each month the table will be updated to correspond to the first month of the water level forecast shown in the *Monthly Bulletin of Lake Levels for the Great Lakes.* Refer to *Update No. 103* for more information about the terminologies involving the wind effects and specific locations of the gages.

International Niagara Board of Control Public Meeting

The International Niagara Board of Control (Board) invites you to a meeting with the public. The purpose of the meeting is to inform the public of the Board's current activities and to hear comments and suggestions regarding the Board's work. The time and location are as follows:

Time: March 23, 1994, from 7:30 to 10:00 pm

Location:
Days Inn
201 Rainbow Boulevard
Niagara Falls, New York

The Board is a bi-national organization reporting to and advising the International Joint Commission on matters regarding water levels, flows, and similar subjects that pertain to the Niagara River.

Robert E. Slockbower LTC, EN
for RICHARD W. CRAIG
Colonel, EN
Commanding

Table 3

Possible Storm Induced Rises (in feet) at Key Locations on the Great Lakes
March 1994

	Degrees of Possibility				
	20%	10%	3%	2%	1%
LAKE SUPERIOR					
Duluth	0.9	1.1	1.3	1.5	1.7
Grand Marais	0.6	0.7	0.9	1.1	1.2
Marquette	0.7	0.8	1.0	1.2	1.3
Ontonagon	0.6	0.9	1.6	2.1	2.7
Point Iroquois	0.9	1.0	1.1	1.2	1.3
Two Harbors	0.8	1.0	1.4	1.7	2.1
LAKE MICHIGAN					
Calumet Harbor	1.5	1.8	2.1	2.4	2.6
Green Bay	1.4	1.6	2.0	2.2	2.4
Holland	0.8	0.9	1.0	1.1	1.2
Kewaunee	0.8	1.0	1.1	1.3	1.4
Ludington	0.8	0.9	1.1	1.2	1.3
Milwaukee	1.1	1.3	1.6	1.9	2.1
Port Inland	1.1	1.2	1.4	1.5	1.6
Sturgeon Bay	0.9	1.2	1.5	1.8	2.0
LAKE HURON					
Detour Village	0.5	0.6	0.7	0.8	0.9
Essexville	1.7	2.2	2.9	3.5	4.1
Harbor Beach	0.7	0.8	1.0	1.1	1.3
Harrisville	0.5	0.7	0.9	1.1	1.3
Lakeport	1.2	1.5	1.7	2.0	2.2
Mackinaw City	0.7	0.8	1.0	1.1	1.2
LAKE ST. CLAIR					
St. Clair Shores	0.7	0.8	0.9	0.9	1.0
LAKE ERIE *					
Barcelona	1.8	2.3	3.0	3.6	4.1
Buffalo	4.0	4.7	5.7	6.3	6.9
Cleveland	1.2	1.4	1.7	1.9	2.2
Erie	1.8	2.2	2.7	3.1	3.4
Fairport	0.8	0.9	1.0	1.1	1.1
Fermi Power Plant	2.2	2.5	2.9	3.1	3.4
Marblehead	1.7	1.9	2.2	2.4	2.6
Sturgeon Point	3.2	3.6	4.0	4.3	4.6
Toledo	3.0	3.4	3.8	4.1	4.4
LAKE ONTARIO					
Cape Vincent	0.8	0.9	1.1	1.3	1.4
Olcott	0.6	0.7	0.9	1.0	1.1
Oswego	0.8	1.0	1.3	1.5	1.8
Rochester	0.7	0.8	0.9	0.9	1.0

* The water surface of Lake Erie has the potential to tilt in strong winds, producing large differentials between the ends of the lake.

Note: The rises shown above, should they occur, would be in addition to the still water levels indicated on the Monthly Bulletin. Values of wave runup are not provided in this table.

Great Lakes Basin Hydrology

During the month of February precipitation on each Great Lakes basin was below average. For the year to date, precipitation is about 10% below average for the entire Great Lakes basin. The net supply of water to Lakes Superior and Michigan-Huron was above average in February, while Lakes Erie and Ontario were below average. Table 4 lists February precipitation and water supply information for all of the Great Lakes.

In comparison to their long-term (1918-1993) averages, the February monthly mean water level of Lake Superior was 1 inch above average, Lakes Michigan-Huron and Erie were 9 inches above average, Lake St. Clair was 16 inches above average and Lake Ontario was 2 inches below its long-term average. Shoreline residents on Lakes Michigan-Huron, St. Clair and Erie are cautioned to continue to be alert to possible adverse weather conditions, as these could compound an already high lake level situation. Further information and advice will be provided by the Corps of Engineers should conditions worsen.

TABLE 4
GREAT LAKES HYDROLOGY[1]

PRECIPITATION (INCHES)

BASIN	FEBRUARY				YEAR-TO-DATE			
	1994[2]	Average (1900-1991)	Diff.	% of Average	1994[2]	Average (1900-1991)	Diff.	% of Average
Superior	0.7	1.5	-0.8	47	2.5	3.4	-0.9	74
Michigan-Huron	1.5	1.7	-0.2	88	3.7	3.8	-0.1	97
Erie	1.3	2.1	-0.8	62	4.2	4.5	-0.3	93
Ontario	1.6	2.4	-0.8	67	4.3	5.0	-0.7	86
Great Lakes	1.3	1.8	-0.5	72	3.5	3.9	-0.4	90

LAKE	FEBRUARY WATER SUPPLIES[3] (CFS)		FEBRUARY OUTFLOW[4] (CFS)	
	1994[2]	Average (1900-1989)	1994[2]	Average (1900-1989)
Superior	26,000	11,000	76,000	67,000
Michigan-Huron	120,000	88,000	177,000[5]	154,000
Erie	28,000	35,000	206,000[5]	188,000
Ontario	28,000	37,000	248,000	223,000

[1]Values (excluding averages) are based on preliminary computations.
[2]Estimated.
[3]Negative water supply denotes evaporation from lake exceeded runoff from local basin.
[4]Does not include diversions.
[5]Reflects effects of ice/weed retardation in the connecting channels.

CFS = cubic feet per second.

For Great Lakes basin technical assistance or information, please contact one of the following Corps of Engineers District Offices:

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For IL and IN:
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U.S. Army Corps
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Chicago, IL 60606-7206
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For MI, MN, and WI:
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